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SID 62-99-33

MONTHLY WEIGHT AND BALANCE REPORT

FOR THE APOLLO SPACECRAFT

CONTRACT NAS 9-150

(U)

PARAGRAPH 8.10 EXHIBIT I

1 NOVEMBER 1964

Prepared by

WEIGHT CONTROL

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION

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INTRODUCTION

The November report continues to reflect the current Block II LOR spacecraft. The current weight status summarizes the changes from the previous Block II status in addition to the changes from the previous Block I status. A summary weight statement for the Block I control weight has been included.

The current status reflects an unballasted Command Module L/D at entry of .34 for Block I and .38 for Block II. The current report reflects a Block II LOR spacecraft decrease of 20 pounds at injection and 55 pounds at the injected spacecraft condition less Service Module propellant. The current injected weight of 90550 pounds is based on a Service Module propellant loading for a specific impulse of 313.0 seconds and a $\triangle$ V budget as defined in SID 64-1344. This is based on a lunar excursion module of 29,500 pounds, excluding crew, for Block II.

The current Block I status reflects a standard manned vehicle based on a 10.6 day mission. The major changes in the Block I are:

Command Module - Addition of post-landing ventilation system and Scientific Equipment, increase in food and decrease in the parachute system and communications.

Launch Escape System - Increase in ballast consistent with Command Module and LES burnout balance requirement.

The current Block II status reflects a 10.6 day LOR mission. The major changes in the Block II are:

Command Module - Increases in food and post-landing ventilation system and a decrease in the parachute system.

Service Module - Decrease in main propellant residuals.

Launch Escape System - Increase in ballast consistent with Command Module and LES burnout balance requirement.

The Earth Orbit Mission Weight Summary reflects the Block I vehicle on the Saturn IB booster with a payload capability in orbit of 33,500 pounds. The payload capability has been reduced by 215 pounds to 33,285 pounds, due to the effective weight penalty of the Launch Escape System, as defined in MSFC Memorandum of 12 June 1964 - Subject: Recommended Saturn IB Launch Vehicle Control Weights. The Service Module is loaded with 8930 pounds of propellant.

BLOCK I

APOLLO EARTH ORBIT MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 NOVEMBER STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10655	1042.3	0.3	5.3	5146	4477	4057
SERVICE MODULE - Less Propellant	9950	909.6	0.8	-1.3	6459	10362	10126
TOTAL - Less Propellant	20605	978.2	0.5	2.1	11653	34444	33740
PROPELLANT - S/M**	8930	869.6	27.3	-11.5	2973	2077	2515
TOTAL - With Propellant	29535	945.4	8.6	-2.0	15838	52635	53083
ADAPTER - S-IV B	3750	643.4	0.0	0.0	9289	12778	12664
TOTAL - Injected	33285	911.4	7.7	-1.8	25183	130911	131296
LAUNCH ESCAPE SYSTEM	8100	1301.3	0.0	-0.1	539	20126	20132
TOTAL - Spacecraft Launch	41385	987.7	6.2	-1.4	25808	364853	365322

NOTES: *Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

**The earth orbital weights are based on a complete Service Module and includes 8930 pounds of propellant. The propellant loading allocation is based on a payload in orbit of 33500 pounds. The payload capability has been reduced by 215 pounds to include the effective weight penalty due to the Launch Escape System increase from 6600 pounds to 8100 pounds.

BLOCK II

APOLLO LOR MISSION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 NOVEMBER STATUS

ITEM	WEIGHT POUNDS	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10070	1043.0	0.4	6.3	4677	4202	3855
SERVICE MODULE - Less Propellant	10055	913.9	-4.6	8.0	6999	10986	10938
TOTAL - Less Propellant	20125	978.5	-2.1	7.1	11607	33134	32764
PROPELLANT - S/M**	37225	900.5	2.9	-1.2	19355	17617	24291
TOTAL - With Propellant	57350	927.9	1.1	1.7	31229	68101	74279
LUNAR EXCURSION MODULE	29500	588.5	0.0	0.0	19409	21485	21219
ADAPTER - LEM - S-IV B	3700	645.3	0.0	0.0	9304	12779	12663
TOTAL - Injected	90550	805.8	0.7	1.1	59961	608070	613858
LAUNCH ESCAPE SYSTEM	7945	1297.7	0.0	-0.2	545	19570	19564
TOTAL - SPACECRAFT LAUNCH	98495	845.4	0.7	1.0	60509	1009171	1014951

NOTES: *Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

**The propellant weight of 37225 pounds is determined from an estimated time line analysis. The propellant weight is based on a specific impulse of 313.0, and includes 310 pounds of loading tolerance allowance.

BLOCK I

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 NOVEMBER STATUS

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10655	1042.3	0.3	5.3	5146	4477	4057
LAUNCH ESCAPE SYSTEM	8100	1301.3	0.0	-0.1	539	20126	20132
TOTAL - Launch Abort	18755	1154.2	0.2	3.0	5714	91260	90817
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3190	1296.0	0.0	0.0	-69	-1288	-1288
TOTAL - LES Burnout	15565	1125.0	0.2	3.6	5638	73226	72791

NOTE: *Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

BLOCK II

APOLLO LAUNCH ABORT CONFIGURATION

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

1 NOVEMBER STATUS

ITEM	WEIGHT	CENTER OF GRAVITY*			MOMENTS OF INERTIA (SLUG-FT^2)		
		X	Y	Z	ROLL (X)	PITCH (Y)	YAW (Z)
COMMAND MODULE	10070	1043.0	0.4	6.3	4677	4202	3855
LAUNCH ESCAPE SYSTEM	7945	1297.7	0.0	-0.2	545	19570	19564
TOTAL - Launch Abort	18015	1155.3	0.2	3.4	5263	85997	85604
LESS - MAIN AND PITCH MOTOR PROPELLANTS	-3190	1296.2	0.0	0.0	-69	-1288	-1288
TOTAL - LES Burnout	14825	1125.0	0.3	4.2	5184	68095	67712

NOTE: *Centers of gravity are in the NASA reference system except that the longitudinal axis has an origin 1000 inches below the tangency point of the Command Module substructure mold line.

BLOCK I

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

EARTH ORBIT MISSION

1 NOVEMBER STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10655	1042.3	0.3	5.3	5146	4477	4057	10	-224	14
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4						
Food	-62	1053.0	-28.6	37.0						
Add: Waste-Fecal	15	1039.0	47.0	12.0						
CO_2 Absorbed	53	1016.8	-4.2	27.7						
Potable Water	30	1022.6	-63.4	-16.4						
Waste Water	56	1022.5	-21.1	61.8						
PRIOR TO ENTRY	10739	1042.0	0.3	5.5	5208	4523	4099	25	-247	19
Less: Propellant	-135	1022.6	-5.1	56.6						
Ablator Burnoff	-365	1016.2	-0.4	15.7						
Entry Coolant	-6	1022.6	-63.4	-16.4						
Forward Heat Shield	-414	1098.5	0.0	0.4						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	9763	1040.5	0.4	4.8	4749	3798	3449	21	-159	25
Less: Main Chutes (3)	-382	1091.7	-0.3	7.7						
Propellant	-135	1022.6	-5.1	56.6						
LANDING	9246	1038.7	0.6	4.0	4593	3471	3163	28	-142	32

NOTE: Mass inertia data is shown for accumulative totals only.

BLOCK II

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LUNAR ORBIT RENDEZVOUS MISSION

1 NOVEMBER STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10070	1043.0	0.4	6.3	4677	4202	3855	11	-278	26
Less: Boost & Mission Water	-8	1022.6	-63.4	-16.4						
Food	-54	1053.0	-28.6	37.0						
Docking	-150	1110.0	0.0	0.0						
Add: Waste-Fecal	15	1039.0	47.0	12.0						
CO_2 Absorbed	48	1015.4	0.0	28.5						
Potable Water	30	1022.6	-63.4	-16.4						
Waste Water	56	1022.5	-21.1	61.8						
PRIOR TO ENTRY	10007	1041.7	0.3	6.6	4735	4094	3745	26	-284	29
Less: Propellant	-135	1022.6	-5.1	56.6						
Ablator Burnoff	-365	1016.2	-0.4	15.7						
Entry Coolant	-6	1022.6	-63.4	-16.4						
Forward Heat Shield	-300	1090.0	0.0	1.0						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	9145	1041.1	0.5	5.9	4302	3526	3247	22	-206	35
Less: Main Chutes (3)	-407	1090.4	-1.2	7.5						
Propellant	-135	1022.6	-5.1	56.6						
LANDING	8603	1039.0	0.7	5.0	4147	3196	2952	27	-189	43

NOTE: Mass inertia data is shown for accumulative totals only

BLOCK I

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

LOW ALTITUDE ABORT CONDITION

1 NOVEMBER STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10655	1042.3	0.3	5.3	5146	4477	4057	10	-224	14
Less: Oxidant	-180	1022.6	15.6	62.4						
Forward Heat Shield	-414	1098.5	0.0	0.4						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	10005	1040.1	0.0	4.6	4913	3956	3658	22	-144	-19
Less: Main Chutes (3)	-382	1090.8	-1.8	6.2						
Fuel	-90	1022.6	-46.5	44.9						
LANDING	9533	1038.2	0.6	4.2	4788	3677	3353	15	-140	15

NOTE: Mass inertia data is shown for accumulative totals only.

BLOCK II

COMMAND MODULE

WEIGHT, CENTER OF GRAVITY AND INERTIA SUMMARY

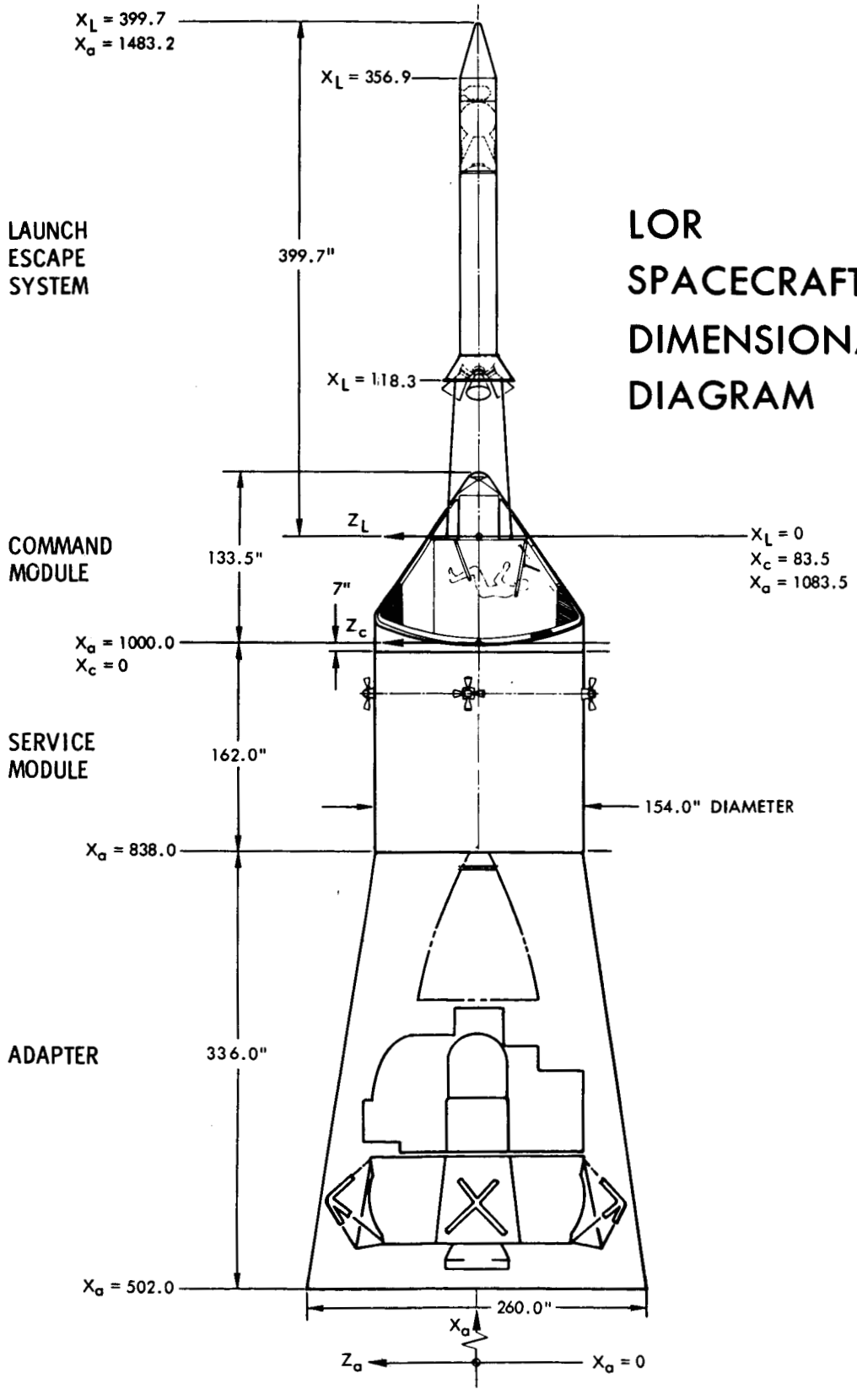
LOW ALTITUDE ABORT CONDITION

1 NOVEMBER STATUS

VEHICLE MODE	WEIGHT POUNDS	CENTER OF GRAVITY			MASS INERTIA DATA (SLUG-FT.^{2})					
		X	Y	Z	Ixx	Iyy	Izz	Ixy	Ixz	Iyz
COMMAND MODULE, LAUNCH	10070	1043.0	0.4	6.3	4677	4202	3855	11	-278	26
Less: Oxidant	-180	1022.6	15.6	62.4						
Forward Heat Shield	-300	1090.0	0.0	1.0						
Docking Provisions	-150	1110.0	0.0	0.0						
Drogue Chutes	-56	1089.1	0.0	-21.0						
PRIOR TO MAIN CHUTE DEPLOYMENT	9384	1040.5	0.1	5.7	4464	3685	3456	24	-191	-7
Less: Main Chutes (3)	-407	1090.4	-1.2	7.5						
Fuel	-90	1022.6	-46.5	44.9						
LANDING	8887	1038.4	0.7	5.2	4339	3401	3141	15	-188	27

NOTE: Mass inertia data is shown for accumulative totals only.

LOR SPACECRAFT DIMENSIONAL DIAGRAM



NOTE: This page is to be revised consistent with the Canard Configuration.

CONFIDENTIAL

BLOCK I

SPACECRAFT

WEIGHT STATUS SUMMARY

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10570	+85	10655	22	76	2
SERVICE MODULE	9950		9950	9	80	11
LAUNCH ESCAPE SYSTEM	8060	+40	8100	15	68	19
ADAPTER	3750		3750	27	73	
TOTAL WEIGHT LAUNCH - LESS SPS PROPELLANT	32330	+125	32455	17	75	8

CONFIDENTIAL

BLOCK II

SPACECRAFT

WEIGHT STATUS SUMMARY

(LESS LEM)

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
COMMAND MODULE	10060	+10	10070	55	45	
SERVICE MODULE	10120	-65	10055	28	67	5
LAUNCH ESCAPE SYSTEM	7940	+5	7945	13	69	18
ADAPTER	3700		3700	26	74	
TOTAL LESS PROPELLANT	31820	-50	31770	33	61	6
PROPELLANT	37190	+35	37225		100	
GROSS WEIGHT	69010	-15	68995	15	82	3

INJECTED SPACECRAFT

WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64
COMMAND MODULE	10060	+10	10070
SERVICE MODULE	10120	-65	10055
ADAPTER	3700		3700
LEM	29500		29500
TOTAL S/C INJECTED LESS PROPELLANT	53380	-55	53325
PROPELLANT	37190	+35	37225
TOTAL INJECTED WEIGHT	90570	-20	90550

BLOCK I

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(9352)	(-10)	(9342)	(25)	(73)	(2)
Structure	5008	+168	5176	11	86	3
Stabilization & Control	248	-50	198	10	90	
Guidance & Navigation	392	+38	430	27	73	
Crew Systems	471	-97	374	13	87	
Environmental Control	313	-2	311	35	57	8
Earth Landing System	650	-98	552	7	93	
Instrumentation	575	-307	268	84	16	
Electrical Power	608	+602	1210	91	9	
Reaction Control	359	-55	304	30	70	
Communication	380	-61	319	2	98	
Controls & Displays	348	-148	200	13	87	
USEFUL LOAD	(1218)	(+95)	(1313)	(4)	(96)	
Scientific Equipment	-	+80	80		100	
Crew Systems	825	+15	840	7	93	
Reaction Control	270		270		100	
Environmental Control	123		123		100	
GROSS WEIGHT	10470	+85	10655	22	76	2

BLOCK II

COMMAND MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(8646)	(-3)	(8643)	(63)	(37)	
Structure	4683	+230	4913	54	46	
Stabilization & Control	212	-35	177	100		
Guidance & Navigation	378	+19	397	100		
Crew Systems	395	-97	298	93	7	
Environmental Control	341	-1	340	60	40	
Earth Landing System	736	-169	567	30	70	
Instrumentation	251	-170	81	100		
Electrical Power	625	+421	1046	93	7	
Reaction Control	339	-35	304	30	70	
Communication	313	-39	274	100		
Controls & Displays	373	-127	246	70	30	
USEFUL LOAD	(1414)	(+13)	(1427)	(4)	(96)	
Scientific Equipment	80		80		100	
Crew Systems	950	+13	963	6	94	
Reaction Control	270		270		100	
Environmental Control	114		114		100	
GORSS WEIGHT	10060	+10	10070	55	45	

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
STRUCTURE	(+168.0)	(+230.0)
Decrease inner structure forward section based on a revised estimate for the post-landing ventilation system previously incorporated in Block II only.	-	-4.0
Increase inner structure forward section due to the addition of the post-landing ventilation system to the Block I.	+2.0	-
Transfer earth impact crushable ribs from Earth Landing System due to recoding consistent with system design responsibility.	+40.0	+40.0
Transfer crew couch attenuation from Crew Systems due to recoding consistent with system design responsibility.	+97.0	+97.0
Transfer single point flotation and sea pick-up hook from Earth Landing System due to recoding consistent with system design responsibility.	-	+55.0
Transfer parachute attach fitting from Earth Landing System due to recoding consistent with system design responsibility.	+29.0	+42.0
STABILIZATION AND CONTROL	(-50.0)	(-35.0)
Increase lower equipment bay components based on current Honeywell status reflecting a revised estimate for the humidity fix.	+1.0	-
Transfer electrical wiring, connectors and power junction box to electrical power due to recoding consistent with system design responsibility.	-51.0	-35.0

COMMAND MODULE

CURRENT USEFUL LOAD CHANGES

	BLOCK I	BLOCK II
GUIDANCE AND NAVIGATION	(+38.0)	(+19.0)
Increase navigation base per current MIT status reflecting change required to align the IMU parallel to the Command Module X, Y and Z axes.	-	+5.0
Increase Guidance and Navigation consistent with NASA GFE list reflecting 430 pounds for MIT equipment for Block I.	+4.0	-
Transfer electrical wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-36.0	-40.0
Transfer G&N Displays from Controls and Displays due to recoding consistent with system design responsibility	+70.0	+54.0
CREW SYSTEMS	(-97.0)	(-97.0)
Transfer crew couch attenuation to Structures due to recoding consistent with system design responsibility.	-97.0	-97.0
ENVIRONMENTAL CONTROL SYSTEM	(-2.0)	(-1.0)
Add a post-landing ventilation system and drinking water provisions required for the crew during the post-landing phase.	+13.0	+9.0
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-15.0	-10.0

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
EARTH LANDING SYSTEM	(-98.0)	(-169.0)
Increase drogue chute system based on Northrop status reflecting change in suspension line material from 1200 pound Dacron to 1500 pound Nylon and the addition of reefing ring, line cutters and cutter pockets.	+4.2	+4.2
Decrease pilot chute system based on Northrop status reflecting shorter fabric risers based on calculated lengths.	-0.5	-0.5
Decrease main parachute cluster based on Northrop status reflecting recalculation of suspension lines, reduction of vertical tapes now utilized only through the fifth sail and incorporation of continuous horizontal tapes.	-15.7	-18.7
Transfer wiring, connector and sequence control to Electrical Power System due to recoding consistent with system design responsibility.	-17.0	-17.0
Transfer earth impact crushable ribs to Structure due to recoding consistent with system design responsibility.	-40.0	-40.0
Transfer single point flotation system and sea pick-up hook to Structure due to recoding consistent with system design responsibility.	-	-55.0
Transfer parachute attach fittings to Structures due to recoding consistent with system design responsibility.	-29.0	-42.0
INSTRUMENTATION	(-307.0)	(-170.0)
Decrease PCM equipment based on current Collins status reflecting a revised estimate for the humidity fix.	-3.0	-
Transfer electrical wiring, connectors and junction box to Electrical Power System due to recoding consistent with system design responsibility.	-304.0	-170.0

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
ELECTRICAL POWER	(+602.0)	(+421.0)
Transfer all NAA furnished electrical wiring, connectors and junction boxes from the following systems due to recoding consistent with system design responsibility:		
Stabilization and Control	+51.0	+35.0
Guidance and Navigation	+36.0	+40.0
Environmental Control System	+15.0	+10.0
Earth Landing System	+8.0	+8.0
Instrumentation	+304.0	+170.0
Reaction Control System	+55.0	+35.0
Communications	+48.0	+43.0
Controls and Displays	+76.0	+71.0
Transfer sequence control from Earth Landing System due to recoding consistent with system design responsibility.	+9.0	+9.0
REACTION CONTROL	(-55.0)	(-35.0)
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-55.0	-35.0
COMMUNICATIONS	(-61.0)	(-39.0)
Decrease S-Band Transponder based on current Collins status reflecting dummy module in lieu of active redundant S-Band transponder module.	-8.3	-
Decrease lower equipment bay components based on current Collins status reflecting a revised estimate for the humidity fix.	-3.0	-

COMMAND MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
COMMUNICATIONS (Cont'd)		
Decrease Up Data Link based on current Motorola status reflecting partial actual weights.	-1.7	-
Increase Block II communication equipment based on current Collins estimates.	-	+4.0
Transfer wiring, connectors, coax and junction box to Electrical Power System due to recoding consistent with system design responsibility.	-48.0	-43.0
DISPLAYS AND CONTROLS	(-148.0)	(-127.0)
Decrease launch vehicle EDS display based on current drawing calculations.	-1.3	-1.3
Decrease barometric indicator based on vendor actual weights.	-0.7	-0.7
Transfer wiring, connectors and junction boxes to Electrical Power System due to recoding consistent with system design responsibility.	-76.0	-71.0
Transfer G & N display to Guidance and Navigation due to recoding consistent with system design responsibility.	-70.0	-54.0
TOTAL COMMAND MODULE CURRENT WEIGHT EMPTY CHANGES	-10.0	-3.0

COMMAND MODULE

CURRENT USEFUL LOAD CHANGES

	BLOCK I	BLOCK II
SCIENTIFIC EQUIPMENT	(+80.0)	-
Add Scientific Equipment to the Block I per current NASA recommended changes.	+80.0	-
CREW SYSTEMS	(+15.0)	(+13.0)
Delete the suit mounted communications from the Block I as this item is included in the Gemini suits per current NASA GFE list.	-2.4	-
Decrease gas cooled constant wear garments per current NASA GFE list.	-0.1	-0.1
Decrease personal radiation dosimeter per current NASA GFE list.	-0.5	-0.5
Increase food, packaging and disinfectant per current NASA GFE list based on 2.3 pounds/man-day.	+16.8	+11.0
Increase flight kits based on current vendor proposed weights consistent with NAA requirements.	+2.6	+2.6
Decrease portable light consistent with requirements for the Block I vehicle.	-1.4	-
TOTAL this page	+95.0	+13.0
TOTAL COMMAND MODULE CURRENT WEIGHT EMPTY CHANGES	-10.0	-3.0
TOTAL COMMAND MODULE CURRENT WEIGHT CHANGES	+85.0	+10.0

[redacted]

BLOCK I

SERVICE MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(7831)	(—)	(7831)	(11)	(75)	(14)
Structure	2348		2348	8	77	15
Environmental Control	217	-6	211	12	87	1
Instrumentation	130	-96	34	100		
Electrical Power	1437	+167	1604	24	30	46
Main Propulsion	3090	-33	3057	4	96	
Reaction Control	594	-31	563	20	80	
Communication & Rendezvous Radar	15	-1	14	100		
USEFUL LOAD	(2119)		(2119)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	208		208		100	
Main Propulsion	570		570		100	
TOTAL SERVICE MODULE BURNOUT	9950		9950	9	80	11

BLOCK II

SERVICE MODULE WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
WEIGHT EMPTY	(7902)	(-2)	(7900)	(36)	(58)	(6)
Structure	2451		2451	35	65	
Environmental Control	118	-1	117	20	80	
Instrumentation	138	-101	37	100		
Electrical Power	1428	+180	1608	38	30	32
Main Propulsion	2915	-32	2883	31	69	
Reaction Control	604	-28	576	30	70	
Communications & Rendezvous Radar	248	-20	228	100		
USEFUL LOAD	(2218)	(-63)	(2155)		(100)	
Reaction Control	838		838		100	
Electrical Power	503		503		100	
Environmental Control	208		208		100	
Main Propulsion	669	-63	606		100	
TOTAL SERVICE MODULE BURNOUT	10120	-65	10055	28	67	5

SERVICE MODULE

CURRENT WEIGHT EMPTY CHANGES

	BLOCK I	BLOCK II
ENVIRONMENTAL CONTROL SYSTEM	(-6.0)	(-1.0)
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design requirement.	-6.0	-1.0
INSTRUMENTATION	(-96.0)	(-101.0
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design requirement.	-96.0	-101.0
ELECTRICAL POWER	(+167.0)	(+180.0)
Transfer all NAA electrical wiring and connectors from the following systems due to recoding consistent with system design responsibility:		
Environmental Control System	+6.0	+1.0
Instrumentation	+96.0	+101.0
Main Propulsion	+33.0	+30.0
Reaction Control	+31.0	+28.0
Communication & Rendezvous Radar	+1.0	+20.0
MAIN PROPULSION	(-33.0)	(-32.0)
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-33.0	-30.0
Decrease fuel system gauging supports based on revised estimate consistent with reduced propellant tank length.	-	-2.0
REACTION CONTROL	(-31.0)	(-28.0)
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-31.0	-28.0
COMMUNICATION AND RENDEZVOUS RADAR	(-1.0)	(-20.0)
Transfer wiring and connectors to Electrical Power System due to recoding consistent with system design responsibility.	-1.0	-20.0
TOTAL SERVICE MODULE WEIGHT EMPTY CHANGES	-	-2.0

SERVICE MODULE

CURRENT USEFUL LOAD CHANGES

	BLOCK I	BLOCK II
PROPULSION	-	(-63.0)
Decrease main propellant residuals based on current evaluation of residuals furnished by the Propulsion Analysis Group.	-	-63.0
TOTAL This page	-	-63.0
TOTAL SERVICE MODULE CURRENT WEIGHT EMPTY CHANGES	-	-2.0
TOTAL SERVICE MODULE CURRENT WEIGHT CHANGES	-	-65.0

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BLOCK I

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure	1484	+50	1534		43	57
Ballast Instl. Prov.	29		29		100	
Electrical System	53		53	73	27	
Propulsion System						
Main Thrust	4774		4774		100	
Jettison	434		434			100
Jettison Motor Skirt	92		92			100
Pitch Control	49		49			100
Separation Provisions	15	+1	16	53	47	
C/M Boost Prot. Cover	520		520	100		
LES - NO BALLAST	7450	+51	7501	8	73	19
BALLAST	610	-11	599	100		
TOTAL LAUNCH ESCAPE SYSTEM	8060	+40	8100	15	68	17

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BLOCK II

LAUNCH ESCAPE SYSTEM

WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
Structure	1484	+50	1534		43	57
Ballast Instl. Prov.	29		29		100	
Electrical	53		53	73	27	
Propulsion System						
Main Thrust	4774		4774		100	
Jettison	434		434			100
Jettison Motor Skirt	92		92			100
Pitch Control	49		49			100
Separation Provisions	15	+1	16	53	47	
C/M Boost Prot. Cover	535		535	100		
LES - NO BALLAST	7465	+51	7516	8	73	19
BALLAST	475	-46	429	100		
TOTAL LAUNCH ESCAPE SYSTEM	7940	+5	7945	13	69	18

LAUNCH ESCAPE SYSTEM

CURRENT WEIGHT CHANGES

	BLOCK I	BLOCK II
STRUCTURE	(+50.0)	(+50.0)
Decrease tower structure due to calculation of released drawings for the attachment of the boost cover.	-11.0	-11.0
Increase canard based on actual weight of canard assembly for Boilerplate 23.	+70.0	+70.0
Increase attaching parts based on calculation of current released drawing.	+3.0	+3.0
Delete the nose cone and replace it with a Q-ball consistent with current drawing releases.	-12.0	-12.0
SEPARATION PROVISIONS	(+1.0)	(+1.0)
Increase separation provisions based on current drawing calculations incorporating tension ties for boost cover.	+1.0	+1.0
BALLAST	(-11.0)	(-46.0)
Decrease ballast consistent with canard weight increase supplanting ballast weight.	-70.0	-70.0
Increase ballast consistent with Command Module and LES balance requirements.	+59.0	+24.0
TOTAL LAUNCH ESCAPE SYSTEM CURRENT WEIGHT CHANGES	+40.0	+5.0

BLOCK I

ADAPTER WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK I STATUS		
				%EST	%CAL	%ACT
Structure (Includes Stabilizing Members)	3220		3220	17	83	
Electrical	70		70	82	18	
Separation System	360		360	90	10	
Propellant Dispersal System	100		100	100		
TOTAL ADAPTER	3750		3750	27	73	

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BLOCK II

ADAPTER WEIGHT STATUS

ITEM	PREVIOUS STATUS 10-1-64	CHANGES TO CURRENT	CURRENT STATUS 11-1-64	BASIS FOR CURRENT BLOCK II STATUS		
				%EST	%CAL	%ACT
Structure	3145		3145	15	85	
Electrical	70		70	82	18	
Separation System	360		360	90	10	
Propellant Dispersal System	125		125	100		
TOTAL ADAPTER	3700		3700	26	74	

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE	(-263.0)
Decrease ablator due to incorporating a boost protective cover to carry the boost and abort loads and allow the ablator to be designed for entry temperatures only, also add a thermal control coating which allows a reduction in temperature of the ablator prior to entry from +250 to 100F and allows a reduction of required ablator thickness.	-265.0
Decrease ablator based on reduced ablator thickness accomplished by changing the backface design temperature criteria of +600 F at impact to +600 F at parachute deployment for the aft heat shield ablator.	-50.0
Decrease ablator due to redesign incorporating a flat top forward heat shield that is cut back to station 104.5 and allows external mounting of the docking system which is protected by the Boost Protective Cover.	-20.0
Decrease forward heat shield due to redesign incorporating a flat top forward heat shield that is cut back to Station 104.5 and allows external mounting of the docking system.	-35.0
Increase side hatch cover due to adding provisions to operate the hatch cover latches from the outside and add an aluminum inner sheet which will compensate for thermal distortion experienced when it is opened in deep space.	+10.0
Decrease inner structure due to redesign utilizing a single-point "static gimbal" (flower-pot) chute riser attachment. This arrangement removes the concentrated chute loads from the longerons, and eliminates the main chute riser wrap-around loads from the bulkhead gussets and from the forward cylinder.	-79.0
Decrease the side access hatch and hatch cover due to deleting the window which will not be used for any Apollo lunar landing missions.	-25.0
Increase parachute attach fittings consistent with Block II single-point attachment.	+13.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE (CONT'D)

Increase center section heat shield substructure due to the attachment of the relocated horizontally mounted forward pitch motor assembly.	+7.0
Decrease crew compartment heat shield substructure due to utilizing titanium in lieu of steel for the aft compartment (pork chop) frames.	-41.0
Decrease main display panel due to integrating the various subpanels originally provided to allow design flexibility.	-4.0
Decrease lower equipment bay structure and coldplates due to redesign incorporating full electronic repackaging and method of mounting equipment to the frames at X_c 42 and 20 thus reducing the number of vertical members required.	-45.0
Decrease forward heat shield due to removal of access door to pitch motor.	-5.0
Add lower equipment bay supports required for food compartment which were previously provided by Crew Systems.	+8.0
Add a docking system consisting of a probe and drogue mechanism required to transfer two crewman from CM vehicle to the LEM vehicle in lunar rendezvous.	+150.0
Increase secondary structure heat shield equipment area due to the relocation of the command module to service module umbilical.	+30.0
Delete secondary structure supports required for Block I R&D equipment. (R&D provisions will be defined for each item Block II vehicle.)	-27.0
Add weight reduction contingency	+60.0
Add a (3) bag flotation system.	+40.0
Add a sea pick-up hook to facilitate recovery.	+15.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STABILIZATION & CONTROL	(-21.0)
Decrease equipment due to repackaging for the ring mounted lower equipment bay concept and incorporating redundant switching for eliminating inflight maintenance consistent with humidity and EMI proofing.	-26.0
Add weight reduction contingency.	+5.0
GUIDANCE AND NAVIGATION	(-33.0)
Decrease equipment due to incorporating the Block II G & N system for the lunar spacecraft.	-37.0
Add weight reduction contingency.	+4.0
CREW SYSTEMS	(-76.0)
Increase egress accessories due to adding aids for extra vehicular activities.	+10.0
Delete food storage box supports as this requirement has been integrated with secondary structure design.	-17.0
Decrease crew couch due to redesigning for a unitized configuration offering improved operational capability though compatible with the Block I attenuation system.	-70.0
Add weight reduction contingency.	+1.0
ENVIRONMENTAL CONTROL	(+29.0)
Add a free condensate control required to minimize the amount of condensation in the cabin which if excessively accumulated would harmfully affect the respiration of the crew and cause degradation of electronic equipment.	+10.0
Provide the CO_2 absorber elements with a bypass in order to attain minimum oxygen flow of 10 CFM/Man in 3.5 psia (suited) condition.	+10.0
Add a LEM water transfer system.	+5.0
Increase AiResearch components consistent with current Block II requirements.	+3.0
Add weight reduction contingency.	+1.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

EARTH LANDING SYSTEM	(+15.0)
Incorporate Block II configuration utilizing a single point parachute attachment and repackaging of chutes.	-20.0
Redesign main parachute for higher decending weight.	+35.0
INSTRUMENTATION	(-187.0)
Delete R & D instrumentation required for flight qualifications (R & D provisions will be defined for each end item Block II vehicle).	-186.0
Decrease PCM equipment due to repackaging for the ring mounted lower equipment concept.	-12.0
Add an in-flight test system pane.	+5.0
Add weight reduction contingency	+6.0
ELECTRICAL POWER	(-164.0)
Add a DC-DC line voltage regulator to regulate the output at 28 $\pm$ 0.5 volts for postlanding loads.	+4.0
Increase entry-postlanding batteries based on current landing and postlanding loads.	+21.0
Increase electrical wiring and connectors consistent with the 1300 wire umbilical requirements.	+159.0
Decrease wiring and connectors based on reduced wire gauges and utilizing small connectors.	-240.0
Decrease wiring based on relocating CM to SM umbilical.	-60.0
Delete wiring provisions for Service Module temperature control system.	-4.0
Delete R & D instrumentation wiring and provisions. (R & D provisions will be defined for each end item Block II vehicle.)	-136.0
Add Nuclear Radiation Detection Wiring provisions required for the lunar vehicle.	+1.0
Add wiring provisions for the rendezvous radar equipment.	+17.0
Decrease wiring due to reducing requirement of the controls and displays computer keyboard.	-5.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

ELECTRICAL POWER (CONT'D)	
Add wiring to provide connection between the caution and warning panel and the units previously tested with the in-flight test system.	+5.0
Add provisions for S-IV B EDS interface.	+20.0
Add checkout provisions for the LEM in the stowed and docked position.	+31.0
Add wiring for the up data link display.	+3.0
Add wiring for the high gain control.	+6.0
Decrease wiring based on lower equipment bay repackaging	-20.0
Add wiring required for Block II Controls and Displays modification.	+4.0
Add weight reduction contingency.	+30.0
COMMUNICATIONS	(-45.0)
Delete C-Band antenna and utilize S-Band for low altitude tracking.	-17.5
Decrease equipment and wiring due to repackaging for the ring mounted lower equipment bay concept incorporating humidity and EMI proofing consistent with no inflight maintenance.	-29.1
Replace the scimitar antenna with the "S" band antenna.	+20.4
Transfer the VHF antenna to the Service Module.	-27.4
Delete VHF antenna erection mechanism as this function is built into the Block II system.	-1.8
Add weight reduction contingency.	+9.0
Add coax cabling required for the high gain antenna.	+4.4
Delete orbital HF voice communication capability.	-3.0

COMMAND MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

CONTROLS AND DISPLAYS	(+46.0)
Chem-etch mounting panels for the LOR vehicles that could not be accomplished due to schedule on Block I.	-4.0
Add rendezvous radar panel required for LOR mission.	+7.0
Add Nuclear Radiation Display.	+3.5
Add high gain antenna control required for deep space communication.	+4.5
Increase caution and warning detector	+6.5
Modify control and display for the lunar vehicle.	+20.8
Decrease main display panel due to eliminating subpanels and display by increasing time sharing of display.	-5.8
Add an angle of attack display.	+1.5
Add an up-data link display.	+10.0
Add weight reduction contingency.	+2.0
TOTAL COMMAND MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II (to be brought forward)	-699.0

COMMAND MODULE

CURRENT ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II

CREW SYSTEM	(+123.0)
Add two portable life support systems based on the current requirements of the LOR vehicle and LEM	+120.9
Decrease hygiene and medical storage boxes based on redesign of containers that cannot be accomplished on early Block I vehicles.	-6.9
Utilize Apollo spacesuits in lieu of Gemini.	+13.0
Add spare glove, repair kit and ring seals for the Apollo spacesuit per NASA.	+3.7
Decrease survival kit based on NASA information reflecting (1) three men life raft in lieu of (3) one man life rafts and their associated equipment.	-8.5
Decrease food based on current NASA requirements.	-9.7
Add two charged water cooled constant wear garments per current NASA list.	+7.0
Add weight reduction contingency.	+2.0
Increase Portable light based current LOR requirements.	+1.5
ENVIRONMENTAL CONTROL	(-9.0)
Decrease lithium hydroxide based on lunar mission analysis.	-9.0
TOTAL COMMAND MODULE ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II	+114.0
TOTAL COMMAND MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II	-699.0
TOTAL COMMAND MODULE ESTIMATED CHANGES FROM BLOCK I TO BLOCK II	-585.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

STRUCTURE	(+103.0)
Add structural beef-up required to support the rendezvous radar equipment.	+35.0
Add structural provisions for supporting the high gain antenna required for deep space communication.	+30.0
Increase structural provisions for the C/M to S/M umbilical fairing due to enlarging the capacity to 1300 wires.	+9.0
Increase engine mount and backup structure due to stiffness requirements.	+50.0
Add micrometeoroid protection in outboard sectors of the four propellant tanks to afford the greatest reliability. The shielding will be of an internal type mounted directly to the outboard panels.	+110.0
Decrease structure due to reducing factor of safety from 1.5 to 1.4 on all structures requiring redesign.	-25.0
Decrease outer shell panel based on redesign to a simi-arched structure with a lesser end moment requirement and a change in the helium pressurization access door from structural to nonstructural.	-50.0
Decrease radial beams due to reduction in web gauges, stiffener cap area, and inner and outer cap areas.	-13.0
Decrease forward bulkhead due to redesigning to a spider truss structure in lieu of honeycomb panels.	-84.0
Decrease aft bulkhead due to a reduction of face sheet thickness, density of honeycomb core, and the outer ring.	-10.0
Add support shelves for relocated equipment from Sector I.	+50.0
Decrease insulation on aft bulkhead due to reduction in Q-felt density.	-9.0
Decrease outer shell panel due to an increase in radiator size required by philosophy change allowing selective freezing.	-10.0
Add weight reduction contingency.	+20.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

ENVIRONMENTAL CONTROL	(-94.0)
Delete RCS temperature control system as this system is not utilized on the Block II vehicle.	-116.0
Increase radiator size based on philosophy change allowing selective freezing.	+22.0
INSTRUMENTATION	(+3.0)
Add radiation detection sensors to the Service Module.	+3.0
ELECTRICAL POWER	(+4.0)
Increase intermodular plumbing due to adding radiator valves required on the Block II vehicles	+9.0
Increase wiring, connectors and shape charge consistent with the 1300 wire umbilical.	+106.0
Decrease wiring and connectors based on reduced wire gauges and utilizing small connectors.	-130.0
Increase shape change based on relocated umbilical requirement.	+20.0
Decrease wiring based on relocating CM to SM umbilical.	-10.0
Decrease cryogenic tanks due to utilizing super insulation.	-31.0
Decrease sequencer based on removing battery and utilizing fuel cell power for pyrotechnics.	-7.0
Decrease oxygen tank support shelf consistent Block II relocated shelf allowance.	-6.0
Delete wiring provisions for Service Module TCS.	-5.0
Add provisions for LEM monitoring in stowed position.	+22.0
Add wiring provisions for high gain antenna.	+13.0
Add wiring provision for rendezvous radar equipment.	+6.0
Add weight reduction contingency.	+17.0

SERVICE MODULE

CURRENT ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II

PROPULSION	(-174.0)
Decrease propellant and oxidizer tank gauges based on refined tank pressure regulation by utilizing precision valves which allow design for pressure relief at 225 psi rather than 240 psi.	-50.0
Decrease propellant and oxidizer tanks due to shortening the tanks for a 41,000 pound usable propellant.	-191.0
Add isolation valves to the SPS to allow for maintenance with loaded propellant tanks.	+40.0
Add weight reduction contingency.	+27.0
REACTION CONTROL SYSTEM	(+13.0)
Increase reflectors and insulation based on service module boost heating and RCS plume impingement.	+15.0
Reduce attachments for structural closeouts on RCS panels.	-8.0
Add weight reduction contingency.	+6.0
COMMUNICATIONS & RENDEZVOUS RADAR	(+214.0)
Add high gain antenna system required for deep space communications.	+56.0
Add rendezvous radar equipment consistent with the LOR requirements.	+143.0
Transfer VHF communication antenna from the Command Module.	+29.0
Delete orbital HF antenna required for Block I only.	-14.0
TOTAL SERVICE MODULE ESTIMATED WEIGHT EMPTY CHANGES TO BLOCK II (To be brought forward)	+69.0

SERVICE MODULE

CURRENT ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II

MAIN PROPULSION	(+36.0)
Decrease Helium quantity based on reduced volume.	-11.0
Increase residuals consistent with current propellant requirements.	+47.0
TOTAL SERVICE MODULE ESTIMATED USEFUL LOAD CHANGES FROM BLOCK I TO BLOCK II	+36.0
TOTAL SERVICE MODULE ESTIMATED WEIGHT EMPTY CHANGES FROM BLOCK I TO BLOCK II	+69.0
TOTAL SERVICE MODULE ESTIMATED CHANGES FROM BLOCK I TO BLOCK II	+105.0

LAUNCH ESCAPE SYSTEM

CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II

C/M BOOST PROTECTIVE COVER	(+15.0)
Increase boost cover due to adding provisions to accomplish rapid opening of the main hatch for egress while on the pad.	+15.0
BALLAST	(-170.0)
Decrease ballast consistent with current Command Module LES balance requirements.	-170.0
TOTAL LAUNCH ESCAPE SYSTEM ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II	-155.0

ADAPTER

CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II

Decrease S-IV B Adapter utilized on the Block I vehicles due to removing the structure trusses required to stiffen the Adapter when the LEM is not installed.	-75
Add a LEM dispersal system utilizing a dependent type system.	+25
TOTAL ADAPTER CURRENT ESTIMATED WEIGHT CHANGES FROM BLOCK I TO BLOCK II	-50

BLOCK I

COMMAND MODULE

POTENTIAL WEIGHT CHANGES

STRUCTURE	(+57)
Modify crew access hatch by adding handles to the outside of the outer hatch in order to help the inside crew on the pad and prevent damage to the ablative material.	+2
Add a three bag single point flotation concept per current ground rules for final revision to Block I specification.	+40
Add a sea pick-up to facilitate recovery per NASA DEI.	+15
STABILIZATION & CONTROL	(+5)
Add a manual TVC to the SCS to provide a redundant electrical capability to control the SPS so that a single electrical failure will not prevent a De-Orbit Delta-V maneuver by the SPS, in Block I.	+5
CREW SYSTEM	(-70)
Utilize unitized crew couch on Block I per current ground rules for final revision to Block I spec.	-70
ENVIRONMENTAL CONTROL	(+78)
Add water for cooling during earth orbit based on the inability of the radiators to supply sufficient cooling.	+78
EATH LANDING SYSTEM	(+36)
Redesign main parachutes for a higher descending weight.	+35
Increase sea dye marker life to 12 hours in lieu of 6 hours per NASA/NAA Recovery Aids Meeting.	+1
INSTRUMENTATION	(+10)
Add a display meter and selector switching for intermittent monitoring of measurements formerly accessible via the in-flight test system.	+5
Increase F.Q. Recorder based on preliminary data reflecting a change in material from magnesium to aluminum.	+5

BLOCK I

COMMAND MODULE

POTENTIAL WEIGHT CHANGES

ELECTRICAL POWER	(+51)
Increase wiring provisions based on potting connectors due to humidity requirements.	+30
Increase entry-postlanding batteries based on current landing and postlanding loads.	+21
CONTROLS & DISPLAYS	(-18)
Add an angle of attack display for launch vehicle EDS.	+2
Incorporate integral illumination of FDAI.	+3
Delete the Entry Monitoring System from the Block I consistent with NASA direction.	-23
TOTAL COMMAND MODULE POTENTIAL WEIGHT CHANGES	+149

BLOCK I

SERVICE MODULE

POTENTIAL WEIGHT CHANGES

ELECTRICAL POWER	(+34)
Increase fuel cell based on latest vendor status reflecting provisions for parallel module operation and addition of start-up potasium hydroxide wetting agent.	+19
Increase wiring provision based on potting connectors due to humidity requirements.	+15
REACTION CONTROL	(+27)
Increase reflectors and insulation based on Service Module boost heating and RCS plume impingement requiring addition of cork installation.	+15
Add Service Module RCS propellant tankage vents to increase service life of propellant tanks by reducing the cycling of bladder during the fill and drain operation.	+12
TOTAL BLOCK I SERVICE MODULE POTENTIAL WEIGHT CHANGES	+61

BLOCK I

LAUNCH ESCAPE SYSTEM

POTENTIAL WEIGHT CHANGES

C/M BOOST PROTECTIVE COVER	(+75)
Increase boost cover due to adding provisions to accomplish rapid opening of the main hatch for egress while on the pad.	+15
Increase boost cover due to redesign replacing zipper closures with solid laminate edge members, doublers and screws.	+60
PROPULSION SYSTEM	(+20)
Increase main thrust motor based on current Lockheed status reflecting average actual weights of the production escape motors	+20
TOTAL BLOCK I LAUNCH ESCAPE SYSTEM POTENTIAL WEIGHT CHANGES	+95

BLOCK I

CONTROL WEIGHT

SUMMARY WEIGHT STATEMENT

COMMAND MODULE

		BLOCK I
WEIGHT EMPTY (SUBSYSTEMS)		(9681)
Structure		5350
Structures Mechanical	3648	
Heat Shield Ablator	1477	
Earth Impact & Flotation	225	
Stabilization & Control		230
Guidance & Navigation (GFE)		430
Crew Equipment		311
Environmental Control		313
Earth Recovery		615
Instrumentation		309
Operational	92	
Research & Development (Includes 34.5 lbs. GFE)	217	
Electrical Power		1253
Wiring & Connectors	651	
Electrical Power Equipment	455	
Automated Sequencer Control	147	
Reaction Control		331
Communications		324
Displays & Controls		215
USEFUL LOAD		(1319)
Scientific Equipment		80
Crew & Equipment		839
Reaction Control Propellant		270
Environmental Control (Includes 13.5 lbs. cooling water)		130
TOTAL COMMAND MODULE		11000

CONTROL WEIGHT STATEMENT

GOVERNMENT FURNISHED EQUIPMENT

		BLOCK I
GFE Total		(1346.1)
Guidance & Navigation		430.0
Crew Systems		779.3
Crew (50-70-90)	528.0	
Spacesuits (3) (Incl. Suit Mtd Comm)	90.8	
Survival Kit	68.1	
Food Set for 10.6 day mission	73.6	
Drinking Water Probe	0.5	
Medical Equipment	4.2	
Bioinstrumentation	3.8	
Radiation Dosimeters	5.0	
Constant Wear Garments	5.3	
Instrumentation (R&D)		34.5
PAM/FM/FM Package	16.0	
Gas Chromatograph	9.5	
Commutators (3)	9.0	
Scientific Equipment		80.0
"Q" Ball (LES)		22.3

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BLOCK I

CONTROL WEIGHT

SUMMARY WEIGHT STATEMENT

SERVICE MODULE

		BLOCK I
WEIGHT EMPTY (SUBSYSTEMS)		(8081)
Structure		2451
Environmental Control		215
Instrumentation		35
Electrical Power		1655
Electrical Power Equipment	1367	
Wiring & Connectors	248	
Automated Sequence Control	40	
Service Propulsion		3136
Reaction Control		589
USEFUL LOAD		(2119)
Reaction Control Propellants		838
Electrical Power Reactants		503
Environmental Control Oxygen		208
Service Propulsion Residuals		570
TOTAL SERVICE MODULE		10200

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CONTROL WEIGHT STATEMENT

LAUNCH ESCAPE SYSTEM

SUMMARY

		BLOCK I
Structure		1537
Tower	437	
Escape Motor Skirt	231	
Canard	829	
Nose Cone & Attachments (In Lieu of "Q" Ball)	40	
Separation Provisions		15
Ballast		644
Propulsion		5410
Escape Motor	4826	
Jettison Motor	535	
Pitch Motor	49	
Electrical Power		55
CM Boost Protective Cover		539
TOTAL LAUNCH ESCAPE SYSTEM		8200

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CONTROL WEIGHT STATEMENT

ADAPTER

SUMMARY

		BLOCK I
ADAPTER		
Structure		3225
Basic Body Structure	3070	
Secondary Structure	155	
Insulation		20
Separation Prov. & Attach.		360
Electrical Provisions		70
Propellant Dispersal System		125
Total Adapter		3800
Additional Structural Members to Replace LEM Load Carrying Capabilities on Block I		100